SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1875.—Vol. XLI. LONDON, SATURDAY, JULY 29, 1871. PRICE ..... FIVEPENCE PER ANNUM, BY POST, £1 4s.

Original Correspondence.

BIRMINGHAM, AND THE BLACK COUNTRY.

THE INTENDED VISIT OF THE IRON AND STEEL INSTITUTE TO STAFFORDSHIRE.

The visitors, after inspecting the Round Oak Works, will proceed to the Earl's New Level Furnaces. Several great improvements are taking place here, which, when completed, will make this equal, if not superior, to any plant in Staffordshire. The native ironstones alone are used, together with coke made from the Thick and Heathen coals, the raw coal, and limestone. There are four furnaces at present, but another is being built; they are of a circular shape, and composed of red brick lined with white, and bound round with wrought iron hoops. The height of each is about 48 feet, and the diameter in the boshes 14½ feet. There are two blast-engines, both of them condensing, and worked with beams. The one now in use is very old, and has a steam cylinder 44 inches in diameter, a blowing cylinder 88 inches in diameter, and a stroke of 8 feet. The second engine is quite new, never having been at work, and has been constructed at the Earl of Dudley's fitting shops; the steam cylinder is 46 inches in diameter, the blowing cylinder 92 inches, and the stroke 8 feet. The steam has been generated for the old engine in balloon-shaped boilers, but these will shortly be done away with, and eleven cylindrical boilers, 48 feet long by 7 feet diameter, some of which are now put down, will replace them, and supply both engines. Arrangements are being made to heat the new boilers with the waste gases from the furnaces, and a large stack, the largest in the district, 250 feet high by 12 feet square throughout, has been erected, to draw these off. The casing is being fitted to the furnaces for the same purpose, and consists of a wrought-iron flue encircling the top, having cast-iron framed openings leading from it to the interior of the furnace; wrought-iron tubular flues will connect these encircling flues with the boilers. There is an oblong-shaped hot-air oven to each furnace, containing 24 syphon pipes, 10 in. by 4 in. inside. The main till lately used for conveying the blast from the engine to the ovens and furnaces was placed underground, but this being considerably worn a new one has been made, and the old one taken up. The new one is placed upon columns along the back of the furnaces, and it is as well, as all the connections are exposed and more easily attainable when repairs are needed. This main is a fine structure, and consists of a wrought-iron tube, having a partition from end to end, so that both engines can work at the same time, and yet there be no connection as regards the blast. At the termination of the main, near the engines, there is a wrought-iron receiver, supported upon cylindrical columns, up through which the blast is conveyed from the old engine to the main. An ornamental staircase surrounds one of the columns, and joins at the top a platform, which is fixed to the side of the main. The valves may either be worked from the platform or from below. The blast is supplied to the furnaces at a pressure of about 3 lbs. to the inch, and a temperature of 500°. The tops of the furnaces are surrounded by an iron stage, which is on a level with the ground in the rear, so that a portion of the raw materials used are brought in trucks from the collieries, and deposited close at the furnace mouths. The remainder of the materials come by boat, and are thrown out on to the mine floors, whence it is loaded into barrows, and taken up an incline to the furnaces. A vertical high-pressure beam-engine, with cylinder 20½ in. diameter, and working a 4½-ft. stroke, draws the wagon upon which the barrows are placed up the incline, by means of a flat chain running over pulleys. The cinder is drawn up two other inclines by the same engine, and is taken away by horses and tipped down the "mound."

In front of each furnace there is a casting-house covering the pig-beds; these are comprised of arched walls, upon which rest wrought-iron framed roofs, covered with tiles. There is a small but complete gasworks here, at which all the gas used about the furnaces and at Round Oak is made. Amongst the most important works to be visited on the east side of Dudley are the Bloomfield Ironworks, the property of Messrs. William Barrows and Sons. A full description of these appeared in the Supplements to the *Mining Journal* of January 14th and 28th, but we shall, for reasons before explained, again briefly notice the main features. Three distinct works are classed under the heading of the Bloomfield Ironworks; they are the Bloomfield Works proper, the Factory Works, and the Tipton Green Works. All are situated at Tipton, about a mile from Dudley, and constitute one of the largest finished ironworks in the district. These works have been longer established than almost any other in Staffordshire, and are better known as Barrows and Hall's, and few can boast the reputation they enjoy as makers of a good quality of finished iron, as the Bloomfield brand is known almost anywhere where iron is used. Over 2000 men and boys are employed at these works, and the quantity of finished iron they can produce is about 1200 tons per week. The Messrs. Barrows are merely manufacturers of finished iron, and purchase all their pig-iron and fuel. These works are of historic interest in connection with the manufacture of iron, for in them the late Mr. Joseph Hall made many valuable experiments, and accomplished several important improvements; a glance at these will be found interesting. Mr. Hall was one of the most experienced and skilful makers of wrought-iron that Staffordshire has produced, and to him is attributed the invention of the "wet" puddling, or pig boiling, process. Some few years before his death, he published a small work, entitled "The Iron Question: considered in connection with Theory, Practice, and Experience, with special reference to the Bessemer Process." In this work he lays down his claim to the invention of the process above referred to, for it may be as well to state that his right to be credited with it was disputed. However, this may be, and granting that he was not the first to think of the process, there is no doubt that he was the first to develope and work it with success. The old method of puddling was carried out upon a sand bottom, but in Mr. Hall's process this was done away with, and the iron bottoms were firstly coated with solid oxidised compounds of iron, and with a thickness of liquid cinder, consisting principally of protoxide of iron. By using such "fettling" as we have described the boiling process was brought about, for the oxygen contained in the cinder, &c., decarburised the pig-iron, and caused carbonic oxide to be produced below the surface of the molten metal, and this in its endeavours to escape gave the appearance of boiling.

Mr. Hall patented the invention of "bull-dog," or roasted tap cinder, to be used for puddling-furnace bottoms, but his right to this invention is questioned. To facilitate the pig-boiling process, Mr. Hall designed an improved furnace bottom, formed of cast-iron plates surmounted by projecting fire-bricks. In his little work Mr. Hall gives a few excellent rules for conducting the operations of puddling. They are as follows:—"First, charge the furnace with good forge pig-iron, adding, if required, a sufficiency of flux, increasing or diminishing the same in proportion to the quality and nature of the pig-iron used. Secondly, melt the iron to a boiling or liquid consistency. Thirdly, clear the iron thoroughly before dropping down the damper. Fourthly, keep a plentiful supply of fire on the grate. Fifthly, regulate the draught of the furnace by the damper. Sixthly, work the iron into one mass before it is divided into balls. When thus in balls take the whole to the hammer as quickly as possible, after which roll the same into bars for mill purposes."

At the Bloomfield Works proper there are four forges, each containing a helve, a train of rolls, and a pair of shears worked by a condensing beam-engine. Steam is supplied partly from furnace-boilers and partly from hand-firing cylindrical boilers. In the four forges there are 46 puddling-furnaces. Attached to No. 4 forge engine there is a blowing apparatus, consisting of two cylinders or blowing tubs, in which there are pistons worked from an overhead crank. No. 5 forge is called the scrap side, as it is devoted to the conversion of wrought scrap-iron into bars. There are five ball-furnaces, having the old-fashioned sand bottoms, in which the scrap is heated. The condensing beam-engine in this forge has a cylinder 40¼ in. diameter, and works a stroke of 5 ft. In No. 6 forge there is a high-pressure engine, with cylinder 18⅜ in. diameter, and a stroke of 3 ft., which drives a helve and forge train. There are eight puddling-furnaces. From the end of the forge-train there is worked a "bull-dog" crushing-mill, in which the roasted tap cinders are ground and prepared, to be again used as "fettling." The first mill is called the "big mill," and is a 14-in. merchant train. The heaviest bars made at the works are rolled here, but these do not run very large. This mill is driven from No. 1 forge engine, and at the back of it there is a strip mill and a slitting mill. A Smith's steam-saw cuts the ends of the bars from the large mill, and the pipes are prepared for the rolls in two heating furnaces. The 9-in. guide-mill is driven by a condensing beam-engine, having a cylinder 36½ in. diameter, and a stroke of 5 ft. Near the guide-mill there is also a hoop-mill, and there are two heating furnaces. No. 2 forge engine drives No. 2 "big mill" and a wire-mill; the latter is geared from the end of the former. Each mill has two heating furnaces. The top or Jerusalem mill is a middle-sized merchant mill, and is driven by a high-pressure beam-engine, with a cylinder 21½ in. diameter, and a stroke of 5 ft. There are two heating furnaces and one pair of shears to this mill. The "new mill," or small merchant train, is driven from No. 5 forge engine; there are two heating furnaces and one pair of shears connected with it. The plate and sheet mills are worked from No. 3 forge engine, and the slabs, or blooms, for the plates are worked under the forge helve before being rolled. For these mills there are four pairs of shears, four heating furnaces, and one annealing furnace. The two latter are excellent mills, and turn out good plates and sheets, for which the firm are celebrated. There are several roll turning-lathes about the work driven by separate engines.

Near the works there are two foundries, at which the machinery castings are made. The iron is melted in two air furnaces, and there is also a small wrought-iron cupola. The whole of the repairs to the engines and the machinery are done by a staff of millwrights kept on the ground, and there is a small fitting-shop, containing several useful machines. The Factory Works are next in point of size to the Bloomfield, and are situated some hundred yards from them, on the outskirts of the town of Tipton. Two forges and a mill are contained in these works. In the first forge there is a beam-engine, having a cylinder 33 in. diameter, working a stroke of 7 ft. Two boilers supply the steam. A large helve, a forge train, consisting of two sets of rolls, and a pair of shears, are driven from the above engine. There are 13 puddling furnaces and a ball furnace. The merchant-mill is driven by a condensing beam-engine, with cylinder 37½ in. diameter, and a stroke of 7 ft.; supplied with steam from three large boilers. This engine also gives motion to a "bull-dog" crushing-mill and two pairs of shears. The second forge machinery, consisting of a large helve and a roll-turning lathe, is driven by a high-pressure beam-engine, with cylinder 18½ in. in diameter, and a 3-ft. stroke. There are twelve puddling furnaces.

The Tipton Green Works are situated in the centre of the town of Tipton, and in them there is a forge and merchant-mill. A condensing beam-engine, with 30-in. cylinder and 4-ft. stroke, drives the forge machinery, consisting of a large helve, and a train of rolls. There are 12 puddling-furnaces and one ball-furnace. The merchant-mill and two pairs of shears are driven by a high-pressure engine, with 20-in. cylinder, and stroke 2 ft. 8 in. Considering the time the Bloomfield Works have been in operation the machinery is kept in a remarkably good condition.

COATING METALS WITH NICKEL.—By the invention of Mr. E. D. NAGEL, Hamburg, iron, steel, and other oxidisable metals are coated with an electro deposit of nickel or cobalt, in the following manner:—The inventor takes 400 parts by weight of pure sulphate of the protoxide of nickel by crystallisation, with 200 parts by weight of pure ammonia, to form a double salt, which he then dissolves in 6000 parts of distilled water, and adds thereto 1200 parts of ammoniacal solution of the specific gravity of 0·909. The electro deposition is effected by an ordinary galvanic current by using a platinum positive pole, the solution being heated to about 1000° Fahr. The strength of the galvanic current is regulated according to the number of objects to be coated. For coating with cobalt 138 parts by weight of pure sulphate of cobalt are combined with 69 parts of pure ammonia to form a double salt, which the inventor then dissolves in 1100 parts of distilled water, and adds thereto 120 parts of ammoniacal solution of the specific gravity of 0·909. The electro deposition is effected as with the nickel process.

STEAM GENERATORS.—The invention of Mr. R. LEES, Hyde, consists in readily increasing the power of the boilers, and at the same time rendering them more economical. For this the inventor attaches to such portion of the surface of the boilers, or of the internal flues thereof, as are exposed to the heat from the furnace spherically-shaped water pockets, or annular pipes, or both the pockets and the pipes. The pockets or pipes are so secured as to break up the flame and absorb heat therefrom. The pockets are formed with necks, by means of which they are firmly attached to the shell, screwing or riveting in such a manner that the water will have free access to the interior of each pocket. To form the annular pipes a tube is in each case bent, or otherwise formed into a ring. In some cases the inventor employs tubes bent or formed into such suitable shapes as will admit of both ends of each tube being attached to the shell of the flue, and being connected with the lower portion of the flue, as in the case of the annular tubes. The pockets or tubes may be formed of iron, steel, brass, copper, or other suitable metal.

ANNUAL MEETING OF THE INSTITUTION OF MECHANICAL ENGINEERS.

The annual meeting of the Institution of Mechanical Engineers was commenced in the Odd Fellows Hall, Middlesborough, on Tuesday morning. There were about 200 gentlemen present, the president of the Institution, Mr. JOHN RAMSBOTTOM, of Crewe, presiding. Among the number present we noticed Messrs. Sampson Lloyd, of Wednesbury, and C. W. Siemens, of London, vice-presidents of the Institution; I. Lowthian Bell, Edward Williams, W. R. I. Hopkins, Jeremiah Head, E. Gilkes, T. Hopkins, John Jones, Mr. J. B. Pease, Mr. Mallett, Mr. Healey, J. Manley, W. Williams, W. Clay, C. Cochrane, T. Greenwood, G. B. Westmacott, E. Jeffrys, W. Crossley, A. C. Hill, J. Shepherd, and W. P. Marshall, the secretary, &c.

The CHAIRMAN having briefly opened the proceedings, the SECRETARY read the minutes of the last meeting, and then read a paper by Mr. William Crossley, of Askam-in-Furness, "On the Manufacture of Hematite Iron." The paper said—In the hematite districts of Lancashire and Cumberland, owing to the peculiarities of the material employed, and other causes, it had not been practicable to make use of all the most recent improvements in the working of the blast-furnace, or to keep pace with the rapid progress made elsewhere. The furnaces of the hematite districts are much the same as those in Cleveland, but the working appliances are not usually so good. Those at Barrow might be taken as a fair type of most hematite furnaces as to size and capacity. They are about 55 ft. high, and 15 ft. diameter at the boshes, having a capacity of about 9000 to 10,000 cubic feet. The furnaces at the Furness Iron and Steel Works, at Askam, with which Mr. Crossley is connected, are 67 feet high, and 19 feet at the boshes, tapering to 18 feet below the gas outlet, having a capacity of 13,000 cubic feet—greater than that of any other hematite furnace in the district. The attempts which have been made from time to time to work large furnaces with hematite ores do not seem to have been attended with such success as to justify the erection of others, the results in one or two instances having been that they were blown-out, and the height diminished to 55 or 50 ft. The Askam furnaces, of 67 ft. in height, did not work well for a good while at first, which was attributed to the smallness of the charging bells in proportion to the width of the furnaces, and larger bells were substituted. The bells at first employed were only 7 ft. 6 in. diameter, but the present ones are 12 ft. 6 in. in diameter, and these are, he thought, the largest of any yet used for hematite furnaces. These furnaces now worked with great regularity, each producing weekly from 400 to 460 tons of iron. For taking off the gas the bell and hopper arrangement adopted in Cleveland has not been found to answer so well in hematite furnaces, the Carnforth and Askam works being the only two places at which the plan is at work in the hematite districts. The reasons against adopting it at other places are that it is believed to act prejudicially on the quality of the iron, and throws a heavy back pressure on the furnace. The first objection, Mr. Crossley thought, would not be entertained without more positive proof; and the second was met by the fact that there are hematite furnaces in which the closed top has been adopted with apparently perfect success, and it has not been found that increased back pressure acts prejudicially, except that it throws increased work on the blowing-engines. He came to this conclusion from the fact that a furnace with two gas outlets, one of 4 ft. and the other 5 ft. diameter, did not work better than another furnace with only one 5-ft. outlet, all other conditions being the same. His opinion was that the sole explanation of the alleged failure of the closed top system was the improper distribution of materials, owing to the bell not being suitably proportioned to the size of the furnace-throat. The paper was illustrated with diagrams, one of which represented a furnace in course of construction at the Askam Works, the height of which is to be 75 ft. diameter, 23 ft. at the boshes, having a bell 14 ft. in diameter. These dimensions have been adopted to ascertain whether the same advantageous results can be gained up to 75 ft. as have been had in Cleveland. The diameter, 23 ft., has been adopted, and it is the greatest of any furnace in the hematite district, under the conviction that owing to the compact nature of the materials used it is necessary the diameter should be increased to maintain regularity in the descent of the materials, and to facilitate the upward passage of the blast, which has been one of the difficulties met with in high and narrow hematite furnaces. The writer then explained the nature of the ores found in the Lancashire and Cumberland districts, and the purposes for which they were used, stating that the ore used at Askam, unlike that of Cleveland and most other ores, contained no alumina, and it was, therefore, necessary in many places to mix it with aluminous ores for the purpose of producing a better slag, and of obtaining greater regularity in the working of the furnace, and also of controlling, in some measure, the percentage of silica in the iron. Lithomarge has been longest in use, and is preferred at some works, but the percentage of silica in lithomarge is so high in proportion to the alumina that a very large quantity must be used to produce any appreciable difference in the composition of the slag, and in the smelting of the materials in the furnace; and it contains so high percentage of moisture as to be an injurious effect in cooling the escaping gases of the furnace, and thereby of increasing the consumption of fuel per ton of iron. After showing the care necessary in charging the furnace with great regularity, with a material so difficult to deal with as hematite ore, the writer stated that the result of the working of the Askam No. 2 furnace, of 67 ft. in height, 19 ft. diameter at the boshes, and 13,000 cubic feet capacity, was a consumption of 22·75 cwts. of coke per ton of iron made, when making Bessemer iron, and using the Askam ore mixed with about 10 per cent. of black nodular ironstone, known as Fisher's Red Bog ore, and 9¼ cwts. of limestone per ton of iron made.

The blast was found to be an average of 934° Fahr., and that of the escaping gases at the top 712° Fahr. In making Bessemer iron a specially high intensity of heat was required. For making forge-iron the same furnace would work well with 2 cwts. less coke per ton, and the temperature of the escaping gases had been found to be much lower when this quality of iron was being intentionally produced. Another point worthy of attention was the small percentage of carbonic acid in the escaping gases, which seems to indicate either that the ore is not so easily reducible as supposed, or that from its compact nature or bad mechanical condition the reducing gases do

not ascend with the regularity obtained with the Cleveland furnace, and consequently do not affect the reduction in the higher and cooler part of the furnace, which is favourable to the production of carbonic acid at such a temperature as to prevent its own subsequent reduction to carbonic oxide; and the very high temperature of the escaping gases from the hematite furnaces appeared to the writer to support such a conclusion. It was evident from the examination of those results that if it be possible in Cleveland to get gases evolved from the furnance at as low a temperature as 312° Fahr. (as is done at the large furnaces at Ferry Hill), and containing as much as 15 per cent. of carbonic acid, then it follows that for the purpose of making Bessemer iron the maximum size of the furnaces for working with the greatest economy of fuel has not yet been reached in the hematite district. On the other hand, the hematite ore is not so easily worked as Cleveland ironstone, and does not admit of the free passage of the ascending gases, which is so essential to the good working of the furnace. In fact, there were other questions to be considered in the manufacture of Bessemer iron which are as important as economy, if not more so; and although the previous attempts at increased height in hematite furnaces have not answered expectations, Mr. Crossley expressed himself sanguine as to the success of the 75-feet furnaces now being erected at Askam.

Mr. WHITWELL gave the results of his experience respecting the height of furnaces. The West Cumberland Iron Company had put up a furnace 70 feet high, with conveniences for drawing off at the centre. With 750° to 800° pressure of blast unlimited up to 4½ lbs. they went on making grey iron the first week. They afterwards got into white iron, and could not get into grey. They continued the experiment for a year, and then cut down to 55 ft., and now they were making Bessemer iron. With a furnace 55 ft. high at Consett, 20 ft. bosh, a burden of two-thirds Cleveland and one-third hematite, Mr. Bell in the Transactions of the Institute stated that he found the blast 1350°, and the temperature of the waste gases at 478° only. When they compared that result with the furnaces at Askam, which were 67 ft. high, and using pure hematite, they found the curious result that the gas of the latter had a temperature of 750°, the furnaces being higher than the last one named.

A discussion followed the reading of the paper in which Mr. CHAS. COCHRANE, Mr. CLAY, Mr. J. B PEASE, and others took part.

Mr. BELL explained that high furnaces were *per se* a disadvantage, but for the operation of smelting it was necessary to rob the gases of their sensible heat, or as much as the nature of the operation would permit. The time required for reducing one kind of ore was different for that required for reducing another kind. In Cleveland they had to deal with iron somewhat refractory in its nature. Of all the ores he had examined, that which succumbed last to the current of gas, was the stone of the Cleveland Hills. There was a great fallacy about the worth of charcoal. A pound of Durham coal was worth just as much as a pound of charcoal. In the hematite district he thought they had hit upon the size of furnace which suited them.

Mr. CROSSLEY having replied to the various speakers, a cordial vote of thanks was passed to him on the motion of the president.

The SECRETARY then read the next paper, which was by Mr. Isaac Lowthian Bell, and was "On the Preliminary Treatment of the Materials used in the Manufacture of Pig-Iron in the Cleveland District." The following is an abstract of the paper:—The three raw materials employed in the production of pig-iron contain a portion of volatile matter in combination. In the Cleveland district, the fuel obtained from the collieries of South Durham is made up of fixed carbon and ash, combined with about 35 per cent. of substances which, when the raw coal is submitted to heat, escape chiefly in the form of combustible compounds of hydrogen and carbon. The ore contains about 28 per cent. of earthy substances, associated with about 31 per cent. of iron, chiefly in the form of carbonate of the protoxide. In this case, carbonic acid and oxygen, together with some water, constitute the volatile portions. The flux in carbonate of lime being almost pure, contains, therefore 28 of caustic lime united to 22 of carbonic acid. Whatever be the condition in which these substances are delivered to the blast-furnaces, the whole of the volatile portions referred to—the hydro-carbons of the coal and the carbonic acid and water of the ore and limestone, are expelled long before the process of smelting is complete. This expulsion means work and absorption of heat, and hence the usual practice has been to perform the operation in apparatus of a simpler form of labour than that required for completing the process itself. Hence, when it is desired to separate the hydro-carbon from the coke, one or other of the different forms of coke-ovens are employed; and when it is desired to rid the ironstone or flux of their carbonic acid, a kiln is used, in which the raw stone is introduced with a small quantity of the cheapest kind of small coal. When it is remembered that the volatile portion of the coal is highly inflammable, and, weight for weight, has a much greater heating power than the fixed carbon or coke portion, one can understand the regret which is often expressed at the loss of a quantity of heating material, which on the make of pig-iron in this district may be taken as equivalent to one million tons of coal per annum. The value of this quantity of fuel cannot be taken at less than 250,000*l.* at the pit's mouth, and therefore represents something like 4s. on every ton of pig-iron manufactured by means of Durham coke from Cleveland ore. The volatile matters found associated with the metal in the ironstone, besides a trace of sulphur and a notable quantity of water, are carbonic acid and oxygen. The sulphur, or at least that which exists in sulphide of iron may be entirely expelled from iron by heat, but it is not improbable that a portion of the resulting sulphurous acid may be taken up by the lime which exists in the ore. The water is entirely driven off, and shows itself in clouds of steam at the top of the mine kiln. The carbonic acid united with the iron is likewise entirely dissipated when the operation is properly conducted. A trace, however, is usually found in calcined stone, which is probably in the form of carbonate of lime or magnesia. As regards the oxygen this element not only remains undiminished in respect to quantity, but the iron passes into the state of peroxide, taking up one-half more oxygen gas than that originally existing in the ironstone.

The paper dealt fully with the consideration of the nature of the operation of smelting as it is effected in the blast furnace, and pointed out what the condition of the materials ought to be at the period of their being charged at the top. After alluding to the Appolt's coke oven, and other ovens, Mr. Bell stated that notwithstanding the difficulty which existed in instituting a very rigid comparison between two different kinds of fuel in blast furnaces, he was in favour of coke made in the ordinary oven. Hitherto they had regarded the blast furnace as engaged in merely melting the iron and slag, for which a certain quantity of heat was required. This heat in round numbers for foundry iron might be regarded as that resulting from the combustion into carbonic oxide of 20 cwt. of average quality of coke burnt with air heated to 850° or 900° Fahrenheit. Whatever might be the loss of fuel in the upper part of the furnace, they must bear in mind there must be at disposal this quantity of coke more or less at the tuyeres. The result of the action of the oxygen of the blast was carbonic oxide, which was the substance that might be regarded directly or indirectly as exclusively affecting the reduction of the ore, and it might be added supplying the carbon found in the pig-iron. After discussing the question whether there would be any advantage in relieving the blast-furnace of this portion of its work by introducing the ore in which the iron is contained already in a deoxidised state, Mr. Bell stated that there was no doubt that the application of any process which would remove from the blast furnace every trace of carbonic acid would cause the process to be less dependent upon the nature of the sources of the heat than was the case at present. If it were possible to heat the blast still higher than 1400°, the coke per ton of iron made would be so much increased; but dealing with the question according to present experiences, the additional cost of the preliminary deoxidation of the ironstone would appear to be too much to render its adoption advisable, inasmuch as the margin of saving, by avoiding the presence of carbonic acid on the furnace, is compressed within 1½ cwt. of coke per ton of iron when the blast is heated to about 1400°. In conclusion, Mr. Bell was of opinion that there was little economy of fuel to be hoped for by the use of raw coal, or by using the ironstone and limestone calcined instead of raw.

In the discussion which followed Mr. Siemens, Mr. C. Cochrane, Mr. Wilson, Mr. Edward Williams, Mr. E. Jones, and Mr. Marley took part, the President proposing a vote of thanks, which was carried with acclamation.

The SECRETARY then read a paper contributed by Mr. Alfred C. Hill, being a "Description of the Improved Compound Cylinder Blowing Engines at the Lackenby Ironworks, Middlesborough." The paper stated that the engines were designed for working with steam, at a pressure of 85 lbs. per square inch above the atmosphere; that the principle of compound cylinders in surface condensers was consequently adopted, one engine being high-pressure non-condensing, and the other a low-pressure condensing engine, supplied by the exhaust steam from the high-pressure engine. One reason why this principle of engine was adopted was that the supply of water at the Lockenby Works, being obtained from gypsum strata, was unsuitable for use in boilers, on account of the large proportion of lime contained in the water; and if ordinary high-pressure engines had been employed water from the works supplying the general district would have had to be obtained, which would have materially increased the cost of the engine-power, and, of course, a proportionate increased cost on the manufacture of the pig-iron. A second consideration, that made it especially desirable to use the steam, was that the waste gases from only two furnaces were for the present available for heating the steam-boilers and the hot-blast stoves, and consequently the supply of gas was liable to be often limited in quantity, from circumstances that do not admit of complete control, so much so as to cause a difficulty in maintaining steam without burning coal under the boilers, whilst also maintaining the high temperature of blast that is so essential as a principal source of economy of coke in the manufacture of pig-iron. The object aimed at was not only to obtain economy in consumption of fuel by the use of a higher class of engine, but to ensure freedom from risk of stoppage arising from the introduction of a more complicated description of engine than had hitherto been usual for this purpose.

The day's proceedings were concluded after the reading of this paper, when the members partook of luncheon, provided at the Cleveland Club, after which they inspected the various works in the district.

On Wednesday the meeting was fully attended. The PRESIDENT (Mr. John Ramsbottom) having briefly opened the proceedings,

The SECRETARY read a paper on "The Geological Features of Cleveland," by Mr. John Jones, of Middlesborough. The author stated that during the last twenty years the Cleveland Hills have risen into national importance as a mining centre, and from them is raised ore in sufficient quantity to produce one-third of the manufactured iron in Great Britain. The Cleveland district, he showed, presents several features not usually met with in iron-making localities. The greater portion of the blast-furnaces are situated near to Middlesborough and Stockton, on each side of the Tees. They stand upon a geological formation that does not yield any of the minerals used in the blast-furnaces. The ironstone is brought a distance of from 3 to 20 miles; the coal and coke are obtained from the South Durham coal field, and the limestone is brought distances varying from 20 to 40 miles. It is found, however, more convenient and economical to fix the works near to the river, as this affords greater facilities for getting away the manufactured article.

Mr. JONES then exhibited several specimens of ironstone, showing organic remains and fossils. He also showed specimens of the whin-dyke, which, he remarked, was the same in structure from Cockfield to the Cleveland hills.

Mr. J. F. WILSON asked Mr. Jones if he could hazard an opinion as to the extent of the salt bed in Cleveland. It would be interesting to know, when 100 years had passed, the third and fourth generation would find employment in the salt trade. He asked if it were probable that the salt might somewhere exist nearer the surface than discovered by Messrs. Bolckow and Vaughan in Middlesborough.

Some remarks having been made by Mr. Stevenson, mining engineer, as to the soft shale, which necessitated great care in sinking for iron (in consequence of the pressure of rock on the timbers), as contradistinguished from the hard stone met with in the coal district, which supported the pressure,

Mr. MARLEY mentioned that Messrs. Bolckow and Vaughan commenced the shipment of iron in 1848 at Skinningrove, where the members would have the opportunity of obtaining additional information on Friday.

Mr. C. W. SIEMENS asked whether in the layers of oolitic formation the amount of phosphorus acid differed materially?

Mr. WHITLEY asked what was the cause of the large deposit of iron in the oceanic bed?

Mr. JONES, in replying first to Mr. Wilson's question, said geologists differed as to the means by which the salt bed had been originally deposited. A generally received opinion was that the salt was originally in lagoons or large lakes, and the water evaporated leaving the salt and other chemical substances; yet this theory was by no means substantiated. Some of the leading geologists did not entertain the opinion. His own opinion was that they would find a considerable deposit of salt near to Middlesborough, because it had been proved to be of considerable thickness, but he did not know that it existed to any great distance on either side. Salt had not been got up in the form of rock, but it had been pumped up with the water. In reply to Mr. Stevenson, he admitted that in many parts of the district certain dislocations had taken place, but if they took the entire district the measures laid very evenly, and the dislocations had been exceedingly trifling. Replying to Mr. Siemens' question about phosphoric acid, he said no doubt the lower part of the strata contained more organic remains than the other portions, and they would contain more phosphoric acid. He had no doubt that the iron ore proprietors would find if they could get rid of the bottom block the pig-iron produced would contain less phosphorus; but he believed it was too valuable to be left untouched, and he had not much hope that the Cleveland furnaces would supply stone containing less phosphoric acid. With regard to Mr. Whitley's question, he was unable to say how iron ore got into the Liassic ocean. His opinion was that the ore was not there when the measures were laid down, but that it existed in another form—carbonate of lime, which had given place to carbonate of iron. As many of the blocks exhibited oolitic structure, he was inclined to believe that the principal part of the ore in the bed of the ocean was the result of impregnation in the upper seams some time after the consolidation of the beds.

The SECRETARY then read a description of the Break-Drums, and the mode of working them on the Ingleby incline of the Rosedale branch of the North-Eastern Railway, from the pen of Mr. J. A. Haswell, of Gateshead. The Ingleby incline is used for the conveyance of ironstone from the mines near Rosedale Abbey, being a portion of the line. It is nearly a mile in length, having a gradient of 1 in 5¾, the steepest being 1 in 5. Loaded trains descend the incline, drawing up at the same time the empty trains, a passing place for the two trains being made in the middle of the length of the incline by a short double line, and the rest is only laid with three rails, the centre one being common to both up and down trains. The incline is worked in the usual manner of steep mineral inclines by means of pair of break-drums keyed down upon a horizontal shaft, and situated at the top of the incline. The descending train of loaded wagons pulls the rope from one of the drums, and winds up that on the other, thereby drawing the return train of empty wagons up the incline. Speed is controlled by powerful breaks upon the drums, regulated by a hand-winch. The peculiarity of the brakes is the use of cast-iron. The drum-barrels are 18 ft. diameter and 4 ft. 8 in. long, made of cast-iron, 1¼ in. thick, and put together in four segments, bolted together. At the top of the incline are a series of pairs of inclined lateral chocks, fixed at intervals between the centre of the rails of the loaded wagon line; these chocks are pressed outwards against the wheels of the wagons, to check the speed of the loaded wagons until the drum-rope is attached to them. The average loaded train weighs 52 tons, and the up load does not exceed 25 tons. Each run on the incline occupies three minutes, so that the speed of the train is 20 miles an hour. In ordinary working 200 wagons are run down per day of 12 hours, conveying 1600 tons of ironstone. These brake-drums have now been at work about 10 months, and superseded two smaller drums of 14 ft. diameter, which have been working about 10 years. The smaller drums were fitted with brakes of wrought-iron and elm wood. These required renewal every five weeks, at a cost of 20*l.*, and thus a saving of 200*l.* per annum is effected by the introduction of the cast-iron surface to the drum and brake.

An interesting discussion followed, in which the Chairman, and Messrs. Haswell, Lee, W. Cochrane, Siemens, Gilkes, James Taylor, Cooper, Chas. Cochrane, King, Bradshaw, and Appleby took part.

The SECRETARY next read a paper by Mr. Jeremiah Head, of Middlesborough, "On a Simple Construction of Steam-Engine Governor having a Close Approximation to Perfect Action."

At the close of the reading Mr. LEWIS OLRICK congratulated Mr. Head on the production of a perfect governor. Messrs. Olrick, Gilkes, Siemens, and Thos. Boyd also joined in the discussion.

The next paper read was by Mr. Chas. Cochrane of Middlesborough, on "Steam-Boilers with Small Water Space, and Root's Tube Boiler," which was lengthily discussed, by the author, Messrs. W. Cochrane, Kesterdon, Olrick, Gilkes, Clay, and others.

The meeting then concluded. Votes of thanks were accorded at the close of each discussion to the readers of the papers, and subsequently on the motion of the CHAIRMAN, to the local committee, and to the local secretaries (Messrs. J. Head and G. Gilkes), for their exertions in promoting the success of these meetings; to the ironmasters, for throwing open their mines and works to the inspection of the members; and to the North-Eastern Railway Company, for the facilities which had been afforded.

There were two other papers on the list on the breakage of axles under railway rolling stock, by Mr. E. Fletcher, Gateshead; and on the principal constructions of breech-loading mechanism for small arms, and their relative mechanical advantages, by Mr. by W. J. Marshall, but these were deferred till the next meeting of the Institute.

A number of breech-loading rifles on different principles in illustration of the last-named paper were exhibited in the hall, and the members after examining these dispersed to luncheon, from whence they proceeded to visit the ironworks in the neighbourhood.

On Thursday the institute visited Stockton, and thence proceeded to Eston and Saltburn, at which latter place they were entertained to dinner at the Zetland Hotel.

Among the Models and Diagrams exhibited, Ashton and Storey showed one of their steam-power meters; Mr. Thomas Morgan, a model of his puddling machine; the Cleveland Bolt and Nut Company, Middlesborough, a number of bolts, nuts, screws, and diagrams of their machinery; Messrs. Fox, Head, and Co., Middlesborough, specimens of their patent non-conducting cement, and a case of minerals and waste products connected with the Cleveland iron manufacture; Henry P. Boyd and Co., Low Walker, a case of bolts and screws; Mr. Thomas Whitwell again exhibited a model of his patent hot-blast stove; Mr. Bryce Craig exhibited his contrivance for signalling between passengers, guard, and driver in a train; he also showed a clever kind of ballot-box; Mr. John MacNay exhibited a variety of india-rubber goods; Messrs. Head, Wrightson, and Co., South Stockton, showed a model of Moore and Head's patent hand-hoist; a model of Janicki's patent floating-dock was shown.

THE MANCHESTER STEAM USERS' ASSOCIATION.—The monthly meeting of this association was held at the offices, Corporation-street, on Wednesday, Mr. J. Petrie, of Rochdale, in the chair. Mr. L. B. Fletcher, the chief engineer, presented his report, from which we learn that an explosion, by which one man was killed and another injured, occurred at an ironworks. The cause of the explosion was one that has been alluded to with monotonous repetition on previous occasions—the weakness of the furnace tube consequent on the neglect of flanged seams or encircling hoops, whether of T-iron, bridge-rail, or other approved section, or of any other efficient means for resisting collapse. Had anyone of these simple precautions been adopted the collapse would have been prevented. It is reported that the owners of the works have made the widow of the poor man who was killed an allowance of 10s. a week for 10 years, which it will be seen involves an outlay of upwards of 250*l.* This, however generous, does not restore the life that has been lost, while a system of compulsory inspection, which would have cost the owners but about 2*l.* per boiler per annum, would not only have prevented the explosion and its consequent loss of life, but also have saved the outlay of the 250*l.*, as well as the loss of the boiler and the interruption of the regular business of the works. The next explosion was of a very disastrous character, at an ironworks, killing as many as eight persons and injuring 20 others. With regard to the cause of the collapse, the furnace-tube, though so gigantic a length as 43 ft., and having a diameter of 3 ft. and a thickness of plating of only ⅜ in., and being subjected to a pressure of 50 lbs. on the square inch, was not strengthened as it should have been by any encircling hoops or other suitable provision to enable it to withstand external pressure. Under these circumstances it should not have been worked with steam exceeding 25 lbs. on the square inch, while even at that pressure so long and large a flue-tube should have had some strengthening appliances. The tube was found on examination to be wasted by corrosion at several of the ring seams of rivets, which rendered it still weaker. But as the tube, if sound, would not have been safe at the pressure at which it was worked, 50 lbs., the primary cause of the explosion was not the wasting of the plates by corrosion, but the omission of encircling hoops or other equally efficient means for enabling the tube to resist collapse. An explosion, by which one man was injured but fortunately no one killed, occurred at a charcoal grinder's. An examination of the plates of the boiler left no doubt as to the cause of the explosion. The plates in the neighbourhood of the primary rent were so eaten away by external corrosion, consequent on moisture, that they were reduced to the thickness of a sheet of paper, and the explosion is, therefore, attributed to the dilapidated state of the boiler. This is another very suggestive explosion in connection with the statements in the Parliamentary Committee's report that "compulsory inspection would lessen the responsibility of the user," and that he "is best able to ascertain the condition of his boiler." In connection with this statements, the fact will not be lost sight of that in this case the owner attended to the boiler himself, and it will be questioned whether any threatened action for damages, in the event of explosion, would restrain a man inclined to neglect a boiler in the way that this boiler was neglected, and whether it is wise, for fear of interferring with the responsibility of such men, to leave them at large to jeopardise the lives of those living near them, and to wait till disaster actually occurs, and the time for prevention is past, before stepping in.

MINERS' ASSOCIATION OF CORNWALL AND DEVON.

The annual gathering of the classes of the Miners' Association took place on Monday, the Providence Mines, Lelant, being selected as the especial point of attraction. The pupils, having arrived from St. Austell, St. Day, Camborne, Hayle, Helston, Breage, St. Just, and Pendeen, were received by the much-respected purser of the mine, Mr. Higgs, and by Captain Hollow, the manager. Some little time was then spent in examining the plans of the mine in the account-house, which were very kindly and patiently described by Capt. Hollow, and Mr. Hodge, the clerk. The stamps, the various engines, the different dressing appliances, the man-engine, the new "dry," and other objects of interest, were then visited and examined with close attention until about 1·30, at which hour the whole party, which numbered 75, and included many mine agents, was invited to partake of a substantial dinner in the account-house.

When full justice had been done to the ample supply of good things provided, Mr. WARINGTON W. SMYTH, F.R.S., who had honoured the classes by his presence, rose to propose the health of the worthy purser of the mine, Mr. Higgs. In doing so he took occasion to refer to the many excellent appliances in use at the mines, either for the sake of economy or with a view of protecting the men employed, as far as possible, from the dangers of their dangerous calling. He also referred to the great advantages which mining had received from the introduction of *wire-rope* instead of hemp-rope or chains, as had been used in nearly all mines until the last few years, and remarked that the Providence Mines were the first to adopt the wire-rope in Cornwall.

Mr. HIGGS, in acknowledging the toast, took occasion to refer in a marked manner to the value of the science classes which had been established in so many places by the Miners' Association, and to the great debt which the country owed to Mr. Robert Hunt, F.R.S. (who was unfortunately unable to be present, from illness), both for the establishment of the Miners' Association in 1859, and for the collection and arrangement of his very valuable annual volume of Mineral Statistics. He also spoke with great approval of the marked success of the classes of the Association within the last few years, under the present lecturer, Mr. J. H. Collins, F.G.S., and his able coadjutors, the former pupils of Dr. Foster and Mr. Richard Pearce.

Brief remarks were also made by Mr. Collins, by Capt. Prior, of Dolcoath, by Mr. Williams, of Hayle, to whom the country is indebted for the introduction of wire-rope, and by Capt. Hollow, who remarked—"If we had not adopted the wire-rope and the skip, the mine would have been knacked."

Allusion having been made to the admirable regulations made for the protection of the men employed from their own recklessness, or that of their comrades, copies of the following notices, which are in the hands of all the men employed, were handed round:—

Rules and Regulations for the Enginemen in Charge of this Engine.

1.—If any defect in the engine, boiler, or machinery connected therewith, or short supply of water for the boiler be discovered by the engineman in charge, that the same be reported to the agent that may be on the mine at the time; neglecting to do so, he will be subject to a fine of 10s.

2.—That any engineman being negligent in not relieving the engineman in charge within half-an-hour of the regular time fixed, be fined 2s. 6d.; or if an hour, 5s.; and if repeated without satisfactory explanation to the managing agent, he shall be *discharged from the mine, and forfeit all wages* that may be due at the time.

3.—The coming-in engineman shall examine the machinery and feed of the boiler, and report the same to the agent on the mine or at the account-house, before taking charge of the engine; neglecting to do so, he shall be subject to a fine of 5s.

P.S.—Any engineman in charge of the engine neglecting his duty is liable to imprisonment.

THE PROVIDENCE MINES.—Notice is hereby given, that any man discovered tamping a hole with an iron bar on naked powder, shall be immediately discharged from the mine; and further, wood tamping-bars are provided, free of cost, and any man found working in blasting ground without one shall be subject to a fine of 5s., and for a second neglect shall be discharged from the mine, and forfeit all wages or money that may be due to him. The money so forfeited

ll be divided rateably among the underground men the next pay-day but one er the discovery is made.

After dinner the company resumed their inspection of the works, and some of young men went underground by means of the man-engine, to see the far-ned carbonas of the St. Ives mining district. At 4·30 a second illustration of est Country hospitality was afforded, by the supply of tea and coffee for all esent, after which—the rain falling heavily—the rest of the time was spent an agreeable and profitable interchange of ideas. At 6 o'clock, with a cheer-ness which no rain could damp, the various classes re-entered the vehicles for eir return, much gratified by the hospitality they had received, and much in-ructed by all they had seen.

THE SCOTCH IRON TRADE.

SIR,—The present appearance of the Iron Trade is, in all its anches, more encouraging, and its prospects more cheering than ey have been for a very long time past. Prices have advanced con-derably, and the tendency is still upward. In the price of pig-iron ere has been, perhaps, the greatest advance, and it is satisfactory think that this advance is the consequence of fair and legitimate ade demand. The absence of rash and unwarrantable speculation, ch as occurs periodically in pig-iron, is one of the best features in e whole trade.

Shipments of pig-iron this year from all Scotch ports up to July 15 sum up ..... Tons	434,265
While for the same period last year they were	353,812
Being ..... in excess of last year's shipments for same dates. These shipments embrace a period of 28 weeks.	80,452

An analysis of the above figures may be interesting. The ship-ents up to and including the week ending April 22 this year were nly 807 tons more than for the same period in 1870. So that of the 0,453 tons increase this year 79,646 are due to the shipments from pril 22 to July 15—a period of twelve weeks.

If the shipments for the last twelve weeks show an increase of ..... Tons	79,646
Shipments from July 15 to Dec. 31 (24 weeks) should show an increase of	159,292
Or an increase for the whole year of	239,938

he estimates of 159,292 tons for the remainder of this year may seem rge, but the result is likely to show a much larger increase. The crease is estimated at about 6637 tons per week, while for the last ree weeks respectively they were 5009, 7798, and 14,534 tons.

The shipments for last year, which this year's prospective ship-ents have to compare with, were almost unprecedentedly small. he declaration of war by France, the consequent demoralisation of ade with that country, and the blockade of the German ports all ended to keep shipments and, consequently, prices at a low point. t the present time, on the contrary, the prospects for legitimate ade were never brighter, and the shipments for last week were the rgest on record. It may be interesting to trace the result the pre-ent rate of shipment will have on the stock of pig-iron in Scotland. he stock at the beginning of this year was as follows :—

In makers' hands ..... Tons	264,295
In Connal's stores	394,520
In canal stores	16,185
Total	675,000
Add to this the make for 1871 (this is estimated the same as for 1870, but there are fewer furnaces in blast now) ..	1,206,000
Total	1,881,000
Shipments for 1871-70 were ..... Tons	619,826
Add estimated increase in 1871	238,938
Gross shipments	858,764
Estimated rail to England (35,174 for 1870)	36,000
Home consumption (506,000 in 1870)	500,000= 1,394,764
At Dec. 30, 1871	486,236
As compared with stock Dec. 30, 1870	675,000
Or a decrease, as at Dec. 30, 1871, of	188,764

This is a very satisfactory state of matters, both as bearing evi-dence of present good trade and as promising well for the future, nd it needs only that all connected with the trade should set their faces determinedly against all undue speculation. It must, at the same time, be borne in mind that the production of pig-iron in the Cleveland district is now very and increasingly large, and that if Scotch pig-iron is forced up to a fancy price the low-priced English iron will so far take the place of Scotch makes. It is, therefore, to be hoped that the value of pig-iron will be allowed to rest on its own merits, and, if this is the case, a good and profitable trade will be done by all those connected with it. OBSERVER.

BRIGGS'S CO-PARTNERSHIP COLLIERIES.

SIR,—One of your correspondents, in the Supplement to last week's Journal, wishes to know the tonnage of coal raised by our company during the year ending June 30, 1869. I have pleasure in supplying the information: we raised in that year 405,987 tons.

Whitwood Collieries, Normanton, July 25. ARCHIBALD BRIGGS, Managing director.

DENUDATION OF THE COALBROOKDALE COAL FIELD.

SIR,—An article appeared in the May number of the Geological Magazine on the above subject by Mr. Daniel Jones, F.G.S., which contains quotations from letters of mine written for the *Mining Journal*, but quotations so unfairly made, in order to give some show of merit to the author's communication, that in justice both to the *Mining Journal* and myself I feel bound to notice them. When I saw Mr. Jones, at the meeting of the Dudley geologists at Lord Hatherton's, he asked me if I saw the Geological Magazine, and upon telling him I did, he said he had written an article in which he had made some reference to my writings on the same subject, but I felt little interest in the matter at the time, knowing that Mr. Jones was familiar with my views, both from having read what I had written and also from having frequently called here and talked the matter over with me. I confess, therefore, that I was not a little surprised upon seeing the article in question a month or so afterwards to find *ex parte* statements, supported by garbled quotations, with here and there a sentence left out, which if retained would have thrown a different light upon the subject; and I only regret that I have not had an earlier opportunity of setting such of your readers right as may have seen the production in question. I can only account for Mr. Jones writing such an article on the ground of his intense anxiety to have it supposed that to him belonged the singular merit of having arrived at the conclusion stated: a conclusion, however, which no one ever doubted, and one which he had derived from those who had arrived at it long before he began to pay any attention to the subject. On page 204, for instance, he speaks of Mr. Scott having "given him data" from which he drew the conclusion, on the merit of arriving at which he seems to pride himself, well knowing at the same time that Mr. Scott had both arrived at that conclusion and shown it, by sections which were published with his paper, read before the Geological Society of London more than ten years ago. This is what he says :—

"I have been at some trouble in ascertaining whether the denudations took place before or after the dislocations, because if before then my lines would be a nearer approximation to the condition of things, but if after then the denuded edges would be thrown forward or recede according to the 'downthrows' or 'upthrows.' Mr. Marcus Scott and Mr. Parton have given me data, from which it appears quite certain that the denudation took place long before the dislocations. The Calaminker (a mottled clay of the upper coal measures), lining the valley of denudation, called the 'Symon Fault' and upper strata, which were deposited after the denudation, are influenced by the dislocations, which must have occurred necessarily even later."

Now, Sir, he knows that Mr. Parton, to whom he also refers, as well as Mr. Scott, had shown the same thing in his paper and sections published on the Shropshire Coal Field; and he knew equally well, from my writings and from the many conversations he has had with me on the same subject, that such were my views. Still I should not have undertaken to depreciate the value of the discovery Mr. Jones is so anxious of having it thought he has arrived at—a discovery, let me say, worthy of a place by the side of the one he tells us in his paper on the Spirorbis Limestone he has made in the southern portion of the field—had it not been for the following passage, in which he says :—

"In this I find my views at variance with those of Mr. Randall, expressed in his thirteenth letter to the *Mining Journal*, where he says—'The whole of the coal strata found in the Hale-field Pits of the Madeley Wood Company was saved from denudation by the mere fact of its having been let down by faults below the same strata which suffered from denudation in the neighbouring field of Stirchley.'"

Now, the language used, even in the passage quoted, has a *local application*, and refers to what—the relative levels being the same—must have been a narrow tongue or headland, as shown on Mr. Scott's map, stretching out into the estuary or valley of denudation, supposing the seams to have been on a level with those which have been cut down and wasted away on either side. It is true, not seeing why they should have been so spared, I thought it just possible—seeing that we have the central focus of great disturbances at several distinct periods in the immediate neighbourhood—that the coals in these pits might have escaped the action of the waves, by reason of having been let down below them. The fact is, I was replying to a statement previously made in the *Mining Journal*, that "denudation was local" only, and that "no dislocating fault existed along the estuary:" and if Mr. Jones, instead of commencing his quotation *in the middle of a sentence*, had commenced it with the beginning of the sentence, as in all fairness he should have done, he would not have laid himself open to the charge of misrepresentation.

Mr. Jones is even more unfair and unjust in the sections he gives to illustrate his own and my views in the filling up of the old estuary, and the relation of both series of coal measures to each other and to the overlying Permians. The quotation he makes from my letter is the following :—

"The valley of denudation, however, does not appear to have been filled up by the younger members of the coal measure series, hence the Permians come up and overlap the whole along an undulating line, running north and south, parallel with that of the Symon fault."

Mr. Jones makes, then, a second quotation, actually leaving out *the one connecting sentence*, which, had it been given, would have explained the whole. The omitted sentence is—"At several places they," that is the Permians, "may be seen overlying the *younger coal measures, south of the old coal field, also the latter group, where the younger are denuded.*" Yet, will the reader believe, in the two sections given Mr. Jones leaves out the upper coal measures in the one which he says represents my views, but introduces them in that which he tells us is intended to represent his own.

I confess I am exceedingly sorry to have to trouble you on a subject so personal to myself, although not altogether so.

J. RANDALL, F.G.S.

THE INSURANCE OF COLLIERY PROPERTY.

SIR,—May I venture to enquire, through the medium of your valuable Journal, whether there will be any duty payable to Government on the insurance of colliery property? Also, whether for the purposes of rating to the poor the cost of such insurance would be deducted from the gross estimated rental? CARBON.

London, July 28.

THE AMALGAMATION OF THE SOUTH-EASTERN AND THE LONDON, CHATHAM, AND DOVER RAILWAYS.

SIR,—The amalgamation of these two companies would be attended with great advantage to the public as well as to themselves. Economy of working is the chief object to be aimed at, and as long as they are competitors for a traffic which is limited in its character much money will be wasted in superfluous wear and tear in keeping up two establishments where one would suffice. It is possible that 10, or it may be 20, per cent. would be saved in the annual out-goings if they were under one management.

The present low price of the Chatham stock would be in favour of the South-Eastern if the two companies were amalgamated; and when we consider that the annual receipts of the Chatham are to the South-Eastern in the proportion of 700,000*l.* to 1,300,000*l.*, and that the whole dead weight of the Chatham, including debenture and preference charges, amounts only to 208,000*l.* on the half-year, the fact of the Chatham stock being at 17½ and the South-Eastern at 86 must excite surprise. It is not that the South-Eastern is too high, but rather that the Chatham stock is far below its relative value.

An amalgamation might be arranged to the satisfaction of all classes of shareholders on the following terms :—

1.—The Chatham debenture stock should form, as at present, a first charge upon revenue.

2.—The 4½ preference stock, which is now at 52, might be capitalised at the price of 60, and this would constitute the first charge after the debenture debt—120,000*l.* per annum.

With reference to the Chatham ordinary stock, which now amounts to 7,743,400*l.*, it is proposed that this also should be capitalised, the South-Eastern giving one ordinary share for four of the Chatham, which would lead to an increase of the ordinary stock to the extent of 1,936,000*l.* The South-Eastern, on these terms, might merge the whole Chatham Railway in their own undertaking at the cost of about 9,000,000*l.* Looking at the vast outlay incurred in the metropolitan extensions, and the access to Dover Harbour, can anyone say that such a line could be completed in the present day for anything like that amount? The actual capital expenditure of the South-Eastern is 18,600,000*l.* Under an amalgamation as proposed the united capital would be 27,600,000*l.* The aggregate receipts at present amount to about two millions. Allowing for a saving in working expenses, and taking the fixed debenture and preference charges at the rate of 4½ per cent., this should admit of a dividend of 5 per cent. on the joint ordinary stock.—*July* 26. X.

"INVESTMENT VERSUS SPECULATION."

SIR,—To become a successful investor one must possess knowledge, judgment, nerve, and money. Knowledge is the product of study; judgment is a natural gift, assisted by knowledge, and, indeed, impossible without study; nerve is also a natural gift, but that, too, may be cultivated by the abnegation of excess, and by moderation in all indulgences. The possession of money may be accidental, or it may have been earned by the possessor, but, taken in the long run, money belongs to the man who has the power and the will to grasp and to retain. Recently we have seen, from signal examples, that vast wealth, handed down from generation to generation, cannot always be held by the hereditary possessor; while we might point to thousands of cases in which the pauper has risen by thought, care, and abnegation to extraordinary wealth. We may further observe that the "Science of Investment" can prove of no practical use unless through study it becomes searching, and when so applied earnest and grasping in its scope.

We are led, Sir, to the above observations from a reference to your valuable columus just ten years ago, July 20, 1862, in which you observe that "the mines chiefly dealt in have been the East Caradon, Marke Valley, East Grenville, Ludcott, East Russell, Ding Dong, West Rose Down, Rosewall Hill, Sortridge Consols, Great South Tolgus, Carn Camborne, West Polmear, Retallack, Merllyn, West Caradon, Unity, North Treskerby, and a few others." Copper at this date (1862) was quoted 93*l.*; tin, 117*l.*; and pig-lead, 19*l.* 5s. to 20*l.* 10s. The present quotations are—copper, 74*l.*; tin, 132*l.*; and lead, 18*l.* 2s. 6d. to 18*l.* 5s. per ton.

That there have been a great number of transactions on the Mining Exchange in each and all of the above mines there can be no question raised, and that the spirit of speculation fosters enterprise is beyond doubt, but there is a wide difference between the Gambler and the Investor. The first is the man who reads nothing. He blunders on, listens to all that wise and foolish say, and does *something*. He must do something, whether right or wrong, and especially so if he has *not* the money wherewith to pay "differences," for the gambler is rarely in a position to take up that which he purchases, or to deliver the stock or shares that he sells. The iniquity of this is so transparent that it is extraordinary that at this advanced age, in the most civilised country in the world, it can be permitted—not, I mean, by the law of the realm, but by that rationality of law which thinking men are supposed to possess in rightful tenure. On the contrary, the true investor calls forth painstaking labour to his aid. He is not the Jobber upon the surface current of a market, and is wholly distinct and the reverse of the haphazard gambler.

Of the mines referred to seven have ceased to exist—namely, Ludcott, East Russell, Sortridge Consols, Great South Tolgus, West Polmear, Merlyn, and Unity, whilst the subjoined stood at the following quotations, as against their present prices—East Caradon, 25*l.*; Marke Valley, 9*l.* 5s.; East Grenville, 2*l.* (ten years' calls to be added); Ding Dong, 22*l.*; Rosewall Hill, 1*l.* 5s.; Retallack, 13s.; and West Caradon, 16*l.* per 1024th share. We refer more especially to the above mines as they are evidently the chosen *vehicles* of market dealings for "account" settlements on the London Exchange, an institution, happily for legitimate and *bona fide* mining enterprise, now defunct. There are risks associated with British mining, but not more so than with joint-stock banking (as it is still called), finance and discount companies, shipping, insurance, building, or other commercial pursuits. It is well known by practical authorities that there are as good fish in the sea as ever were caught, and there are as many prizes in mining as ever have been discovered. Experience is required in the selection of properties to embark capital in, therefore the *uninitiated* should consult practical authorities. There is no investment that pays so well, or that distributes so much and so wide the advantages of enterprise amongst the industrious and deserving working classes, as mining, or contributes to and advances the trade and commerce of the country, both at home and abroad.

The Science of Investment ten years ago would have selected the same class of property to embark capital in that it would do at the present time—namely, *bona fide* and substantial undertakings; and it is only fair to mining to assert that those companies dealt in upon the Mining Exchange ten years ago fostered a species of gambling totally at variance with the principles of true investments, and whilst we admit the great value, convenience, and importance of an open market for the purchase and sale of stocks and shares, yet we cannot but deprecate the uses to which dealers and jobbers on the Stock Exchange apply the vast resources and influence of that powerful institution. It was the case ten years ago as now, that *speculation* is cultivated and promoted, instead of *enterprise* being advocated and fostered. I subjoin a few mines that were open for selection ten years ago, and which now are sound, prosperous investments :—

Botallack	£190,	now	£250 per share.
Carn Brea	65,	"	160 "
Cook's Kitchen	27,	"	28 "
Dolcoath	125,	"	180 "
Herodsfoot	39,	"	44 "
Lisburne	120,	"	200 "
Laxey	1½,	"	17 "
Minera	170,	"	150 "
Providence	30,	"	28 "
South Caradon	300,	"	200 "
Tincroft	5¼,	"	53 "
Wheal Kitty (St. Agnes)	1,	"	9 "
Wheal Owles	300,	"	500 "

The dividends declared in the interim, 1861 to 1871, have been large and remunerative, on an average, throughout—say, 10 to 12 per cent. on market value; and the future is fraught with promise.

In the midst of all our strife and endeavours to warp and direct the capital of the country into speculative instead of sound and *bona fide* investment, the progress of civilisation, intercourse between peoples and nations, and social advancement, with uninterrupted prosperity continue; and there is no reasonable prospect of any serious check transpiring to mar the spirit of confidence in the future now awakened throughout the length and breadth of the land. There is every probability of a bountiful harvest; profound peace for England exists at home and throughout her colonies; the trade and commerce of the country are sound, expanding, and prosperous; the labouring classes well payed, employed, and contented; whilst the mining interests are acknowledged and in the ascendant, with the prices of tin most satisfactory, and likely to render tin mines still more remunerative; therefore, all that is desired on the part of promoters of and adventurers in companies is the exercise of due caution in the selection of those they embark in; then success is certain to follow.

A combination of circumstances tended up to this date to invest a few leading capitalists with nearly all the circulating currency of the country; but it is not for the interests of the community that it should ever become so accumulated. Capital and labour are the two great forces of society, and whenever they are combined prosperity and progress follow; but whenever they become divorced, as has been the case since 1866, distrust is certain to ensue. Now, however, when we are likely to see capital in its normal position, and the spirit of enterprise is already alert, there is almost a certainty of a long and prosperous future to all who are industrious and intelligent enough to profit thereby. R. TREDINNICK, Consulting Mining Engineer.

3, *Crown-court, Threadneedle-street, London, July* 25.

SILVER MINING, IN ENGLAND AND ABROAD.

SIR,—In returning to the subject of English and foreign silver mining, I cannot do better than illustrate it with the prospectuses of the Snowdrift Silver Mining Company, and East Cornwall St. Vincent Mining Company. The former proposes the development of silver mines in Colorado, the latter in the eastern part of the county of Cornwall. The main features of these undertakings are as follow :—

SNOWDRIFT.	EAST CORNWALL.
Capital, 75,000*l.*	Capital, 30,000*l.*
Lease equal to freehold.	Lease, freehold.
Extent of ground on lodes, 2800 ft.	Extent of ground on lode, 6000 ft.
Average produce of lodes, 160 ozs. p. ton.	Average produce of lodes, 160 ozs. p. ton.
Highest assays, 4500 ozs. per ton.	Highest assays, 4600 ozs. per ton.
Ground laid open, 6000 tons.	Ground laid open, 10,000 tons.
Cost of extraction, &c., 18*l.* per ton.	Cost of extraction, &c., 2*l.* per ton.
Position a mountain range, 35 miles from rail or town of note.	Position, 2 miles from rail, 3 miles from shipping port, and 1 mile from a first-class market town.
Land of little importance.	Land of the richest quality, with residences on it fit for families of distinction.
Purchase money, 45,000*l.*, 30,000*l.* in cash and 15,000*l.* in fully paid-up shares.	Purchase money, 20,000*l.*, 4250*l.* in cash and 15,750*l.* in fully paid-up shares, which do not bear any interest until 10 per cent. per annum is paid to the subscribers.

Now, I see nothing to object to in the Snowdrift prospectus, but I want to know why are home properties, which can be visited from any part of the United Kingdom for 5*l.*, worth less than a foreign one? In some instances I know the holding is different. The home companies generally are subject to 21 years lease, and heavy royalties, with land damage. But the East Cornwall St. Vincent has in its holding all that it is possible to possess. They have the freehold, hence one thing is evident (presuming the statements in each case are correct)—the home company's promoters are willing to depend on the success of the mines for their remuneration, while the foreign company consider a bird in the hand is worth two in the bush; and depend upon it, if silver mining in this district is only worked in a legitimate manner, as I am sure the parties connected with it intend to, there will be no fear of the return. The East Cornwall St. Vincent agents are now testing the old ground left by former workers, and the result per assays made this week shows that from this source alone a profit of at least 12,000*l.* a year may be made as soon as the works are in order. The manner of opening up the ground I must leave for another week.—*Harrowbarrow, July* 27. C. PENGILLY.

AMERICAN MINING "EXPERTS"—THE VALUE OF THEIR OPINION.

SIR,—The letter upon this subject in last week's *Mining Journal* has appeared most opportunely. It has occurred to me to be an unaccountable fact that our English capitalists, experienced in home mining, are so ready to accept the opinion of "experts," known only, it may be, to a small and insignificant coterie, in some obscure region on the Pacific coast. "Mining Tourist," whose letter appeared last week, has evidently had experience in such matters, and the instances he cites are certainly most striking, as elucidating the utter valuelessness of the opinion of "experts," even supposing that their judgment is not "warped or contorted" by interested motives.

The proper precaution to adopt—indeed, the only one that should be adopted in such cases—is to select an experienced English authority, a man whose opinion and ability are above reproach and suspicion, to inspect the mine proposed to be purchased, and to acquire it only upon similar conditions to those upon which the Eberhardt and Aurora Mines were acquired—*the value of the ore actually in sight.* If this plan were undeviatingly adhered to, the purchase-money being represented by the value of the ore, the only speculation would be as to the extent and value of the resources to be discovered by a subsequent development. It would also set at rest a large amount of doubt and uncertainty, and at the same time solidify, as it were, the legitimacy of this description of enterprise.

In corroboration of the facts enumerated by "Mining Tourist," I observed in last week's Journal one very striking instance. It was in connection with the Tuolumne Gold Mining Company. It appears

that a letter just received from California was read, in which it was mentioned that—

"There is now a great excitement in this county (Tuolumne) respecting quartz. New veins are being found, and old ones are yielding enormously. *The Confidence Mine, which a San Francisco expert denounced, while he praised the Grizzly* (one of the mines belonging to the Tuolomne Company), is yielding from $35,000 to $50,000 per month, at a cost of less than $5000."

Well may "Mining Tourist" say that no more importance should in any case be attached to the opinion of an "expert" beyond the value of the ore really discovered. MINING INVESTOR.

July 25.

MINING IN NEVADA, U.S.

SIR,—One of your correspondents lately, referring to the Nevada mines, took occasion to state that several mines brought before the British public were unknown out there. I wish he had particularised these mines, which might have relieved the anxiety of some who, like myself, have taken shares in recently got up companies. For instance, I learn that strong insinuations have been thrown out against the Great Western Silver Mining Company. Now, your correspondent would greatly oblige by stating what ground there is for these assertions; and, further, may I, through you, ask the secretary of the company to satisfy us by an assurance that there is no reason for these repeated attacks. It is very possible that they may originate in some personal feeling, and it will be well to know if such is the fact. SHAREHOLDER.

THE SATURN SILVER MINING COMPANY OF UTAH.

The following letter has been addressed to the Editor of the *Times*:—

"SIR,—As one of the directors of the Saturn Silver Mining Company of Utah, I shall feel obliged by your inserting the following remarks in reply to the observations in your Money Article of Monday:—

I have for many years been engaged in business enterprise on the Pacific Coast, being one of the original directors of the Central Pacific Railroad, and having also been largely engaged in mercantile and mining pursuits. I can, therefore, claim some knowledge of business in that country.

When the Saturn Mine was first brought to my notice I, like yourself, was struck with the lowness of the price asked, but the explanation given me as to the circumstances of the vendors, and their reason for wishing to dispose of a portion of their property, in order to secure the remainder, appeared to me then, as it does now, perfectly satisfactory.

I was strongly influenced by the report of Mr. Tilden, as I had known that gentleman personally for upwards of 15 years, and knew him to be a man of great skill and experience, and that his honesty was above suspicion. I accordingly agreed to become a director, and to take personally as large an interest in the company as the directors should choose to allot to me. From this intention I have not deviated.

I believe the directors, as men of business, are quite able to select a fit agent to examine Mr. Tilden's statements, which, if borne out, will leave no doubt as to the value of the property. On the other hand, if the statements are not proved to the satisfaction of the shareholders, the vendors will bear all the loss, and the shareholders' money will be returned to them in full. A. P. STANFORD."

London, July 25.

MINING IN CARDIGANSHIRE.

SIR,—The mines lying north of Goginan are, first, the BWLCH CONSOLS; this mine is the first of any note in the valley. The reports inserted in the Journal from Capt. Northey speak for themselves, and I can add nothing of any interest. Like other mines in this county, once it lay idle for years, after supposed being worked out, but by the new party sinking a little deeper, and extending their levels, the mine has for years done more than ever was expected.

CWM ERFIN, next in the vale, like its eastern neighbour, was for years cast aside through poverty, but by again sinking and driving they have sold thousands of pounds worth of silver-lead ore from this little mine, and by perseverance they yet may do more. The mine at this time is poor; a little improvement was noticed this last week in one of their lodes. I would say to them as I would, and have done many a time, to others—"Look always on the sunny side." Your mine never looked better, and if you get tired and worn out others there are in the back ground who will instantly step forward to try and bring as much, or more, mineral out of it than has ever yet been done, even in its golden days.

SOUTH DARREN, or old Cwm Sebon, comes next in rotation in the vale, remembering that they are east and west lodes, but that the valley is north of Goginan, even from the Bwlch Consols down to the most western extremity of mining in the upper part of Cardiganshire; and as I have to mention the two or three remaining mines in the valley, and to pay them another visit, I will include the South Darren, Darren, Bronfloyd, and West Bronfloyd in my next week's report; and, in conclusion, I beg to thank the two gentlemen, signing themselves "Cymro," in last week's Journal, for t heir so speaking of me. If I were not sufficiently explicit in my former remarks I will try to be so for the future.—*Aberystwith, July* 26. SAMPSON TREVETHAN,
Mining and Consulting Engineer.

[For remainder of Original Correspondence see to-day's Journal.]

CARNELLOE MINE (ZENNOR, CORNWALL).

On Monday a meeting of gentlemen interested in the various mines of the county was held at Tabb's Hotel, Redruth, for the purpose of considering the propriety of working the above property. It was decided to divide the mine into 6000 shares, and a call of 600*l.* was made to immediately commence operations. Capt. William Rich, of Wheal Uny, and other mines, was appointed manager, and Mr. W. G. Nettle, of Liskeard, the purser. From the report subjoined it is considered a most valuable piece of ground, and that there is little doubt it will soon turn out a prize to the fortunate holders:—

Redruth, July 24.—The Carnelloe mining property, in the parish of Zennor, on the north coast of Cornwall, is about midway between the Providence and Lelant Mines on the east, and the Botallack and St. Just mines on the west. The set is of good extent, and contains six east and west lodes already discovered, besides three very fine cross-courses. The south lode is 5 ft. wide at surface; some 20 tons have been broken as a sample, and found to contain tin in paying quantities, even at surface. There are fully 30 fms. of high ground on this lode above sea level always available. The No. 2 lode is 30 fms. north of the former, and has yielded tinstone giving an average of 1¼ per cent. for tin. A shaft has been sunk on this lode 30 fms., but none of the lode has been stoped away. The main lode stands about 15 fms. north of No. 2. A trial shaft has been sunk on the lode 4 fms., and the water has recently been hauled out of this shaft to the 10, which is extended west of shaft 3 fms. The lode in the end is 3 ft. wide, worth 25*l.* per fathom for tin. The eastern end is driven 6 fms.; the lode in this end is small, but looks likely to soon open out again. The lode standing in the back of this level is worth 15*l.* per fathom. Men can be set to stope the tin ground here at once. The average produce of the tinstone from this lode greatly exceeds that of the best mines in the county. The three other lodes spoken of show very fine indications, and tin can be seen in them at low-water mark, but nothing has yet been done on them. There are three very congenial cross-courses—lodes having a bearing nearly north and south. A trial shaft has been sunk 12 ft. on one of these cross-courses, which has yielded excellent work for tin. Similar cross lodes in the Botallack Mine are the most productive of mineral, and these, besides containing tin, offer great facilities for cross-cutting to the east and west lodes. It is at or near such intersections with other lodes good deposits of tin and copper are generally found. Respecting the geological features, the southern portion of the sett abuts on the granite: further north, or towards the sea, there are bands of clay-slate, greenstone, and elvan. The formation is precisely similar to the Botallack and Lelant Mines, which have given over 200,000*l.* to the shareholders. There is not such a striking geological anology on the whole north coast of West Cornwall as that of Botallack, Lelant, and Carnelloe. Lodes in the vicinity of such mixed rocks rarely fail to prove remunerative. As the analogy holds good in a geological point of view, there is fair and reasonable ground for assuming the lodes in Carnello will prove equally productive when further developed, especially as the lodes in the latter mine are more productive at a shallow depth than have been found in the mines referred to. There is very little water in the mine, although so near the sea; the pumps, &c., will therefore be of the smallest size, therefore the outlay will be in underground labour, and in erecting stamping-power to render the produce of the mine marketable. The tin is of the finest quality, and will realise over 80*l.* per ton, and the eastern part of the sett will yield copper. There is ample water power for draining the mine, hauling the ores to surface, and stamping the same. Good and substantial offices, smithy, and carpenters' sheds are already erected, besides roads, water-courses, and reservoirs made. Looking at the geological features, the number of lodes and cross-courses discovered, and the facilities for economically working the same, and the profitable ground opened on the main lodes, this can scarcely be classed as a speculation, but might almost be said to be a certainty, after expending a comparatively small sum to provide means to drain the mine and fix stamping machinery to render the tin marketable.—WM. RICH.

GAS-CONSUMING BOILER FURNACES.—The essentials of a good boiler furnace are few in number, but dependent upon conditions so intricate that their absolute realisation in practice is impossible, and their approximate realisation a matter of extreme difficulty. To supply the quantity of air requisite to secure the perfect combustion of the fuel, without a surplus of oxygen to aid the inert nitrogen in carrying away heat through the smoke-stack—this is the problem which many have attempted, some with more some with less apparent success. Without mentioning the large number of modifications of the plan of supplying air in thin streams or jets to the flame which was so loudly and thoroughly advocated by C. Wye Williams long ago, we propose to make brief mention of a new application of a similar principle (by which some of the more obvious defects of the plan of admitting the air at the rear of the furnace seems to be overcome) on a locomotive on the South Side Railroad at Long Island. The construction of the furnace itself is simple. The fire-box is of the usual form and construction, but behind it the tubes are shortened about half their length to make room for a combustion chamber, divided from the fire-box by a transverse partition, but communicating therewith by a large opening above the partition. The air, admitted through a wire-gauze inlet in the furnace-door, mingles in minute streams with the gases rising from the fire-box, and, being simultaneously heated by and intermingled with the gases, is carried with them to the combustion chamber, where space and time for perfect combustion, which of course prevents smoke and the escape of unconsumed gases, takes place. The water-legs of the boiler have within them vertical partitions, so arranged that the water rising next the heating surface, that on their opposite side of the partitions flows downward, thereby insuring a circulation of the water in a manner easily understood. For stationary purposes, equal results are claimed; a boiler in Chicago and North-Western Railroad machine shop, on the new plan, consumed 2700 lbs. of coal in the performance of work for which the boiler previously in use required 4000 lbs. Should these results be vertified by more extended practice, the new boilers made by the Western Boiler Company of New York City will afford a striking example of the extent to which a scientific principle is dependent for success in practice upon the special manner in which it is applied.—*American Artizan.*

FOREIGN MINING AND METALLURGY.

The deliveries of coal from Belgium by water have not proceeded quite so rapidly as could have been wished. The deliveries made by railway have also left something to be desired; the stock of plant on the French lines continues insufficient, and that to a rather serious extent. The companies complain that as many as 14,000 trucks belonging to them are unfairly detained in Germany. Traffic of every description has, nevertheless, been resumed, and the current of affairs is even very decided. The last report of the Director of Mines in the Hainaut states that the production of the collieries of that province amounted in 1870 to 10,196,530 tons, or 356,000 tons more than in 1869. In 1861 the corresponding production was only 7,955,643 tons. The total of 10,196,530 tons was divided as follows between the three mining arrondissements of the province:—Charleroi, 3,832,850 tons; Mons, 3,694,780 tons; and Centre, 2,668,900 tons. The stocks of coal held throughout the province amounted at the close of last year to 743,874 tons, as compared with 293,586 tons at the close of 1869. The number of workmen employed by the collieries of the province last year was 68,831, of whom 53,327 were employed below ground, and 15,504 on the surface. The amount expended in wages last year was 2,417,616*l.*, and the other expenses of the various collieries amounted to 2,136,221*l.* The number of coke furnaces in activity last year was 2371, and the number inactive was 767.

Both casting and refining pig has been much sought after in Belgium by French industrials. With the exception of rails, all kinds of iron are in good demand. According to the report of the Director of Mines of the Hainaut, there were 28 blast-furnaces in activity in the Hainaut last year, while there were 18 out of blast. These furnaces employed 2648 workmen, and consumed 1,000,775 tons of minerals, 264,824 tons of castina, and 453,892 tons of coke. The production amounted to 34,720 tons of casting pig, and 323,038 tons of refining pig, making a total of 357,758 tons. The rolling-mills of the Hainaut had 389 puddling-furnaces in activity and 42 inactive last year; they had also 156 re-heating furnaces active and 30 inactive. They employed 8002 workmen, consumed 420,688 tons of pig, and 600,888 tons of coal, and produced 305,969 tons of iron. There were 81 foundries in activity in the Hainaut last year; they employed 1428 workmen, and consumed 35,827 tons of rough pig and 9850 tons of coke, and they produced during the year 33,086 tons of cast-iron. The extraction of iron minerals in the Hainaut amounted last year to 86,463 tons. The value of the coal raised in the Hainaut last year was 4,518,078*l.*, and that of the pig and iron made was 3,517,786*l.* An adjudication of 1800 tons of old rails has just been made by the Northern Railway Company; the tenders delivered ranged from 4*l.* 6s. to 4*l.* 16s. per ton.

Affairs have not presented any very great importance in the Champagne district; rough pig has been disposed of tolerably readily at 4*l.* per ton, mixed qualities for refining; and 4*l.* to 4*l.* 8s. per ton for re-casting. Merchants' iron has continued very quiet. There have been large deliveries of machine iron, wire, &c., at former rates. Upon the whole, the condition of the iron trade of the Champagne group cannot be said to improve rapidly; the partial re-establishment of its slow train service by the Eastern of France Company will, however, probably secure a certain increase of activity. The Champagne Committee of Forgemasters has held a meeting, and has discussed the questions of the payment of rent for works during 1870, and the state of the slow train service; upon the first question, that of rents, the meeting expressed its opinion that, under all the trying circumstances of 1870, they might fairly be remitted to the extent of one-half. A letter was read from the Minister of Public Works, to the effect that the railway companies were doing their utmost to resume the slow train service. There is not much news to communicate with regard to the metallurgical groups of the north, the east, and the south of France; work does not absolutely make default, but still it is not abundant; at the same time, the future is regarded with great confidence, and prices are very well sustained. The Northern of France Railway Company has decided on purchasing 500 coal trucks.

The French coal trade displays an increased amount of activity, the week which has just elapsed having been marked by a serious movement of affairs. The mines, unfortunately, cannot deliver so rapidly as they would wish, and a considerable number of merchants are obliged, in consequence of the time required by French and Belgian coalowners for the execution of orders, to import coal from England, although the price of English coal is a little higher. Mention is made of contracts concluded with a Newcastle house at 18s. per ton for steam coal delivered at Havre. It is expected, however, that as soon as the goods train service is fully re-established on the railways the Belgian colliery proprietors will send into France a sufficient stock to provide for the requirements of consumption. The Pontgibaud Mines Company is paying the balance of the dividend for 1870, or 1*l.* 4s. per share. The Carmaux Mines Company is paying the balance of the dividend for 1870, or 2s. 6d. per share. The Loire Mines Company is paying the balance of its dividend for 1870, or 8s. per share.

The French copper markets show a tendency to revive. At Havre, Chilian in bars, good marks, has made 72*l.* per ton, Paris conditions; 25 tons have been dealt in at this rate; refined Chilian and Peruvian in ingots has been quoted at 77*l.* to 80*l.*; and pure Peruvian minerals, 71*l.* to 72*l.* per ton; American descriptions continue to make default, and prices are purely nominal. At Marseilles, Spanish is quoted at 70*l.*; refined Chilian and Peruvian at 72*l.*; and rolled red copper in sheets, at 80*l.* per ton. The German markets have been favourably influenced by the tone of the advices received from other countries. The demand for home consumption is acquiring increased proportions, and speculation has also a tendency to carry prices a little higher. The German tin markets have been very firm. At Rotterdam tin has been slowly advancing; 80¼ fls. has been paid for Banca, while 79¼ fls. has been asked for Billiton, of which the disposable stock is limited. Spanish lead, first fusion, has been quoted at Havre at 18*l.* 16s. to 18*l.* 18s. per ton. The German lead markets have presented considerable firmness. Zinc has also been well supported in Germany, and some rather considerable transactions have been concluded.

THE IRON AND COAL MINES OF LORRAINE.—By the peace of Frankfort (says a German Correspondent) the important iron and coal mines of Lorraine have passed into the hands of Germany. For many years the French, who were anxious to possess coal mines of their own, have been endeavouring to open up the fields of the Moselle, and the works have now progressed far enough to offer considerable hopes of profit. But for Germany, which already possesses extensive coal fields, the iron mines are even more important. The metallic zone, which has always had a great industrial value for France, lies on the Moselle and the Meurthe, below the great eastern tableland of the latter department, and extends from Pont St. Vincent on the south to Longwy on the north. By far the most valuable part of this district has now become German. The ore is found sometimes in a single vein, sometimes in ramifications, with depth of from two to thirty-five metres. The ore is almost inexhaustible, is stated to be very easily melted, and yields on an average 33 per cent. iron. Of the twenty-three mines at present worked thirteen have now become German, and they are far more important than the ten which France has retained; for, while the latter include a district of 2368 hectares, and five of them yielded, in 1867, 140,281 tons, the thirteen which Germany has obtained have an extent of 9031 hectares, and five of them produced in the same year 500,640 tons. The yield of the remaining mines has not been officially published. The iron contains a slight admixture of phosphorus, but in every other respect it is of the finest quality.

QUICKSILVER.—The product of the Quicksilver Mining Company, California, during 1870 amounted to 14,423 flasks, of the total value of $452,062, besides $30,119 for rentals. The expenditure in the same time was $426,575. The company have a funded debt of $1,500,000, besides a large stock capital.

An Indian paper mentions the discovery of a silver and lead mine in the mountains of the Marwar State. The ore is said to be of good quality, and the mine promises to yield a large profit.

MM. Tessie du Mothay and Maréchal have discovered a new process for obtaining hydrogen gas in large quantities. The hydrates of the alkalies, or alkaline earths, are heated with coke or charcoal to a red heat, when carbonic acid and hydrogen are freely eliminated. The carbonic acid is absorbed by water, and a pure hydrogen is collected.

FOREIGN MINES.

DON PEDRO NORTH DEL REY (Gold).—Telegram from Lisbon. Weighed to June 30, 10,668 oits.; estimate for June, 12,468 oits.

EBERHARDT AND AURORA.—The directors received from the mine in Nevada last week 29 bars of silver, valued at 7000*l.*; they also received on Wednesday 43 bars of silver, valued at 9000*l.*, from their mines in Nevada.

SOUTH AURORA (Silver).—Telegram received on Thursday last. "Hamilton, Nevada: Mill started sixth. Nineteen thousand bullion shipped." Extract from letter:—"We have on hand and at mill about 1600 tons of ore dressed, and on dumps about 1500 tons undressed."

TOIYABE (Silver).—The directors have received a telegram from their engineer, stating that within 70 days from commencing work for the company he will produce 500 tons of ore, worth $100 (20*l.*) per ton, and from that time the outfall will be 20 tons daily.

PACIFIC.—Capt. Prideaux, Lander Hill, July 7: I have suspended work in the south cross-cut, and reduced operations in the north cross-cut to two men. After connecting the 550 with the 400, *via* sump winze, the cross-cut will again be driven with all speed. In the north cross-cut we intersected a promising ledge, showing a little silver ore. The ground is exceedingly hard in the rise, and our progress slow.—Stopes: No. 1 is improving. No. 2, no alteration to notice. No. 3, here the ledge is 1½ ft. thick, and the ore very rich; adjoining this stope there is a rich ledge. I shall work this on day-work as soon as convenient. No. 3 stope and the adjoining are in unbroken ground, and at a depth of 650 ft. from surface on the dip of the ledge. No. 4 is looking well. No 5 producing very rich ore. Nos. 6 and 7 yield a small quantity of rich ore. In No. 8 there is no alteration. In Nos. 9 and 10 I have suspended work for a few days; No. 10 is a good prospect.—United Shaft: No change has taken place in this shaft since my last. I have on hand about 30 tons of unassorted ore, which was raised in June; the 1st class of this is worth from $250 to $300 per ton, and the 2d class from $40 to $120 per ton. The mine is improving.

BATTLE MOUNTAIN.—Captain Richards, July 6: Virgin: In the 113 feet level north, and north of the cross-cut west from Roach's winze, the ground is hard and uncongenial for the production of copper ore, and the lode is exceedingly small and poor; this drivage is suspended. In the 73 feet level north the lode is composed of green carbonate of copper, and a small proportion of red oxide on the hanging wall side for 3 or 4 inches in width; the hard part will be cut into occasionally for proof of same; this is a most promising point, and looks as if we may expect some good shoots of ore in this direction. This drivage is suspended during the putting up of Jury's rise in the back thereof, for holing with the 37, for the purpose of getting ventilation and proof of lode. Jury's rise is up 15 feet, and the lode has produced fine rocks of good quality ore—a very promising lode. The lode in Jack's stope, in the back of the 73, is a good orey one; the men engaged herein have been securing the level (73), heavy scales of ground having threatened to give way, owing to the weather bringing out the moisture, and the limestone walls swelling and giving away in consequence. In the 37 feet level north the lode has produced some fine rocks of ore, but it is now again containing only occasional good spots of ore; the whole lode for about 2 feet wide is stained with copper, but of no value, showing the exceedingly bunchy nature of the lode; it is, however, a point that should be pushed forward, as well as the 73.—Lake Superior: Pryce's shaft has been sunk 65 feet, as advised last week, and is now altogether 135 feet deep on the course of the lode, which depth is about equal to 113 feet at Virgin Mine. In the 135 feet level south we have driven about 2 feet; the lode is of large size, and contains a small proportion of copper ore, of no value at present; we shall only resume operations here as time and number of hands admit. It is important, however, that this lode should be thoroughly tested, as it has produced a good deal of ore from time to time. Ore shipped 1271 sacks, weighing 113 tons 4 cwts. 1 qr. 9 lbs.; ore raised during the week, 229 sacks.

ANGLO-ARGENTINE.—Capt. J. Vivian reports for April: General Remarks: Foundation for stamps is in course of erection, but not progressing so rapidly as was at first anticipated, in consequence of our being obliged to lessen the staff of masons engaged thereon, to prepare accommodation for the Englishmen expected. Woodwork of engine and boiler-house is completed. We have a good force excavating for and making drains, water-courses, &c., for conveying sand and stones from reduction works; this and a good deal of other preparatory work is rapidly progressing.—South Mine Captain: The sinking of the engine-shaft below the 44 is progressing rather slowly; ground hard and wet, consequently troublesome to excavate. No change in the cross-cut driving east at the 44; ground also hard The driving of the 32 fm. level cross-cut east to intersect the main lode is resumed; good progress is being made.—Manager: The lode in the adit level driving north is disordered by patches of limestone; stoping the back of this level in a very large and fine looking lode will be commenced next month.—North Mine, Colonel: The adit cross-cut is communicated to the old workings; men are now engaged clearing the same of debris, and securing ground; when completed stoping will be commenced on a large scale.—Surface Works: Two houses for Englishmen and retort-house are completed; temporary residence for the doctor is in course of erection, and the general work of the establishment well kept up. Force is sufficient for our requirements. The health of the establishment continues good.

Reduction Officer's Report: Since my last report the retort-house has been finished, and it is now ready for the reception of the retorts as soon as they arrive. The foundation of the stamps is now commenced, and is being proceeded with as quickly as possible. The assaying materials that I arranged to get from San Juan, as mentioned last month, are not yet come to hand, although it is now six weeks and more since I sent down orders for them. I am in hopes, however, of receiving them in a short time. Meanwhile I have made some further experiments with the batea, which fully bear out the opinion I have already expressed as to the quality and capability of treatment of the ores of these mines.

GREAT WESTERN (Silver).—A telegram, dated Hamilton, Nevada, July 21, has been received from Mr. H. Nelson, one of the directors, expressing his satisfaction with the value of the property, and stating that possession of it having been taken, operations will be commenced forthwith.

LINARES.—July 19: Pozo Ancho: The lode in the 85, west of Crosby's, is not so productive as it was, and the ground getting hard for driving; yielding 1 ton per fathom. In the 75, of the same, the lode is large and strong, yielding good stones of ore. The lode in the 75, west of San Francisco, is disordered and poor in this driving. The 75, east of the same, is opening to good tribute ground, yielding 2 tons per fathom. The lode in the 65, west of San Francisco, is of a promising appearance, consisting of calcareous spar and lead ore, yielding 1 ton per fathom. In the 55, of the same, the lode is very regular, containing a little ore, but not enough to value. The lode in the 45, east of San Francisco, is small and poor in this level.—Shafts and Winzes: The lode in the 175 winze, below the 65, is failing in this sink.—Los Quintentos: In the 65, west of Taylor's engine-shaft, is still unproductive. In the 65, east of the same, the ground in this end is a little more favourable for driving than it has been. The lode in the 55, west of the same, has fallen off in value within the last few days, yielding 1 ton per fathom. The lode in the 55, east of the same, continues large, yielding occasional stones of lead ore. In the 45, east of Addis's, the lode is very compact and solid, looking kindly, yielding ½ ton per fathom. The lode in the 32, of the same, is large and strong, consisting of quartz and lead ore, yielding ½ ton per fathom. In the 32, west of Henty's, the lode in this has been very changeable, varying from 2 to 1 ton per fathom, yielding 1 ton per fathom. The 32, east of the same, is yielding a little ore, with indications of further improvement. The lode in the 32, west of San Carlos, is poor, and the ground hard for driving through. In the 45, of the same, the lode is quite unproductive at present. The 45, east of San Carlos, is opening a splendid run of tribute ground, yielding 3 tons per fathom.—Shafts and Winzes: In San Carlos, below the 45, good progress is being made in this shaft. The eastern end of Martin's winze, below the 32, is going down in a splendid lode, yielding 2 tons per fathom. There is nothing to value in Salvador's, below the 32, at present. The lode in Granero's, below the 32, is small, composed chiefly of gossan and lead ore, yielding ½ ton per fathom. Rafael's winze, below the 45, is suspended for the present, in consequence of an increase of water.

ALAMILLOS.—July 19: The lode in the 60, west of San Rafael, is is small and poor at present. In the 50, west of Martin's, the lode has fallen off in size, and is unproductive. There is no change to speak of in the 50, east of La Magdalena. The lode in the 75, east of Taylor's engine, is large, and of a good appearance, yielding 1½ ton per fathom. In the 50, west of San Jago, the lode is passing through a hard bar of ground, it is of no value. The 30, east of San Victor's, still continues to open fair tribute ground, yielding 1 ton per fm. The lode in the 20, east of Addis's, is rather irregular, yielding ¾ ton per fm. The 20, west of same, is much the same as for some time past, small and poor, and of no value. In the 40, east of Crosby's engine, a cross-head has disturbed the course of the lode; it has also fallen off in value, yielding ¾ ton per fathom. In the 50, of the same, the driving will be resumed shortly. The lode in the 40, west of Crosby's cross-cut, has fallen off in value within the past week, yielding 1 ton per fathom. In the 30, east of Henty's, the lode is smaller and less in value, yielding 1 ton per fathom. The lode in the 20, east of Swaffield's, is very small and poor.—Shafts and Winzes: The ground in San Adrianos shaft, below the 60, is still very hard for sinking through. Fair progress is being made in San Victor's below the 40. The lode in the Serrano's winze below the 50 yields some good stones of lead, yielding ½ ton per fathom. In Jaen's winze, below the 40, the lode is not quite as productive as when last reported on, yielding 2 tons per fathom. The lode in Henty's, below the 20, is still split into branches, yielding ¾ ton per fathom.

RHINE.—Rhenish Prussia, July 25: Schmelzer: Henty's Shaft: Progress is being made in sinking. The shaft is now 5 fathoms below the 17; 5½ fms. remain to be sunk; this has been set to the four new Welsh shaftmen, with others, to be completed in eight weeks, 1*l.* per man per month extra to be allowed if the work is accomplished within the specified time. The Schmelzer lode, north-west, is not looking so well as recently. The Schmelzer end, south-east, has been resumed on, our machine having been temporarily erected by two men. The lode contains blende and spots of lead. Bleibtreu's shaft is being cleared pretty rapidly.—Marienfreude, South Shaft: Fair progress is being made in sinking; the ground is grauwacke. We propose sinking 5 fms. below the 5 fm. level (10 fms. from surface), and proving the lode at that depth.

CAPE (Copper).—The directors have received despatches. The mining reports show no alteration of importance in the operations. Favourable rains had fallen, and the prospects of the riding season continue good. The locomotive was not yet out of the repairing shop, but the mules were carrying down the line 22 tons per day. The transport from the mines during May was:—To Port Nolloth, 565 tons of ore and 100 tons of regulus; to Hondeklip, 33 tons of ore. Yield—Ookiep, 527 tons; Spectakel, 110 tons of ore. Bills of lading are received for 90 tons of regulus and 17 tons of metal, by steamer.

[For remainder of Foreign Mines see to-day's Journal.]

The much-talked-of tunnel across the Channel between England and France is now in a fair way of being carried out. It is stated that the plan of M. de Gamond has been accepted by the French Government. The works, which are estimated to cost about 12,000,000*l.*, will be commenced on one side at Dieppe, and on the other side at Newhaven.

London: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH (the proprietors), at their offices, 26, FLEET STREET, E.C., where all communications are requested to be addressed.—*July* 29, 1871.